Enabling Sustainable CBM+ in the United States Joint Military Services

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September 12, 2007

Presentation Outline

- **Situation Analysis**
- **CBM+ Operative Definition**
- **Discuss strategy for enabling sustainable CBM+ with open standards, leveraging commercial industrial standards**
- **Overview of key CBM+ related standards including key demonstration projects, pilot projects and Army logistics support programs**
  - **MIMOSA Standards**
  - **ISO Standards**
  - **GEIA Standards**
- **Applied research activity – Army, Navy and Marine Corps programs and systems**
- **Recommendations for path forward**

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Situation Analysis

- **The individual military service branches have made substantial progress in their adoption of enabling open standards over the last several years**
- **We are now at the point where DoD level coordination will be very valuable**
  - **CBM+ standards team**
  - **Common standards-based strategy and architecture**
  - **Coordinated pilot projects, sharing the common strategy**

CBM+ Concept

- **Differing military organizations are currently using somewhat different definitions of the term CBM+**
- **We will be referring to a broad definition of CBM+ as a set of sensor through enterprise logistics support business processes which leverage:**
  - **Traditional CBM domain of condition monitoring, diagnostics and prognostics**
  - **Reliability Centered Maintenance (RCM)**
  - **The maintenance mix (Correct mix determined by RCM)**
    - **Condition Based Maintenance**
    - **Phase Maintenance (Preventive Maintenance)**
    - **Corrective Maintenance**
  - **Life-cycle Management and Engineering**

Oil and Gas, and Chemical Industries
Adoption of Cross Industry Standards

Unique Individual & Organization Value Added Approaches (People, Processes and Technologies)

CIDX® open standards that open markets

POSC Caesar

MESA INTERNATIONAL Driving Manufacturing Excellence

OpenO&M™
(MIMOSA, OPC, ISA, WBF/B2MML, OAGi)
+
Open Life-cycle Engineering
(FIATECH, POSC Caesar, ISO TC184)
= Open DOM

Adapt & Adopt

Military Adoption of Industry Best Practices for Platform Sustainment

Applicable Information Standards

Selected Major Standards Entities

W3C

ISO

IEC

OASIS

IEEE

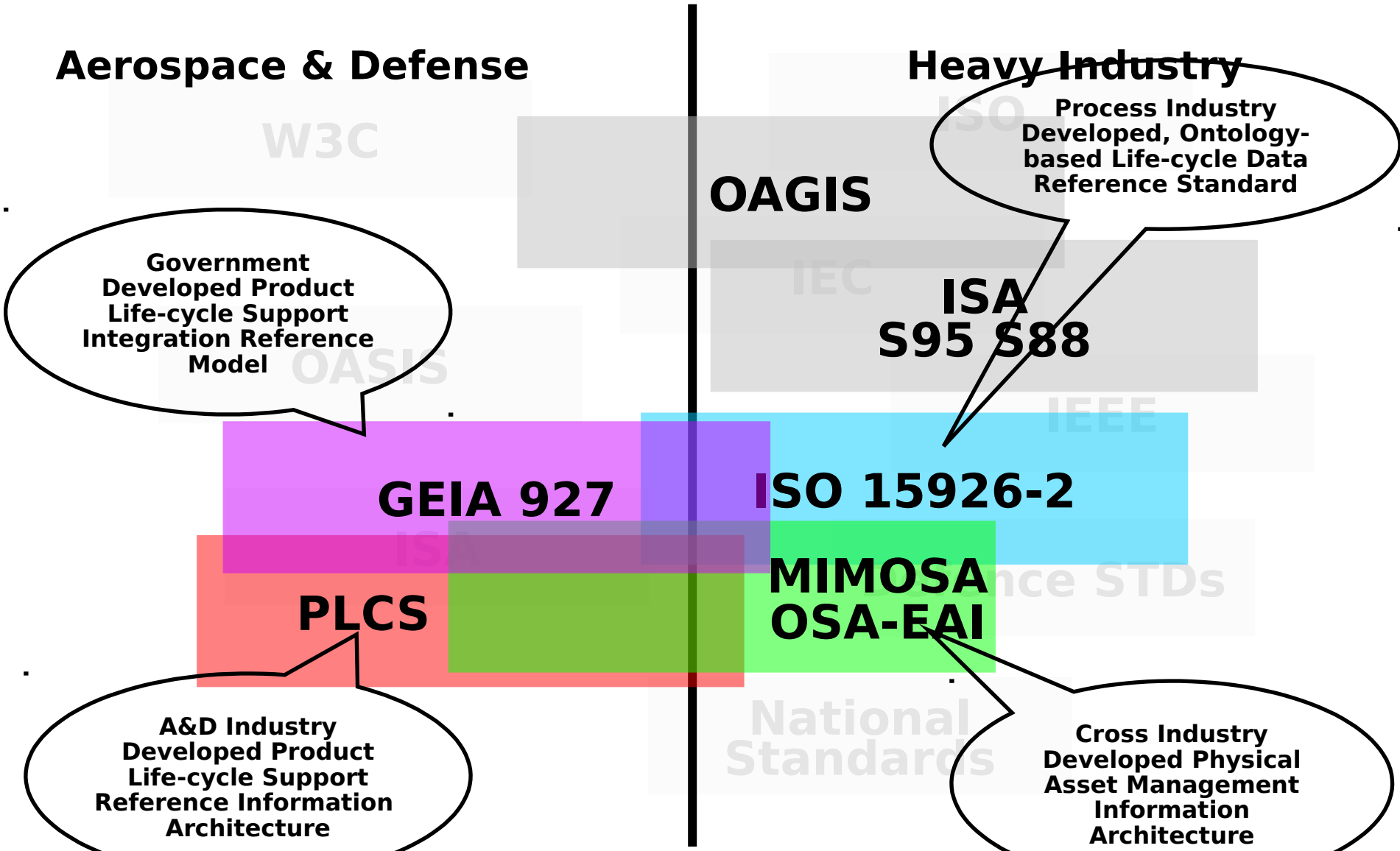
ISA

Defence STDs

National Standards

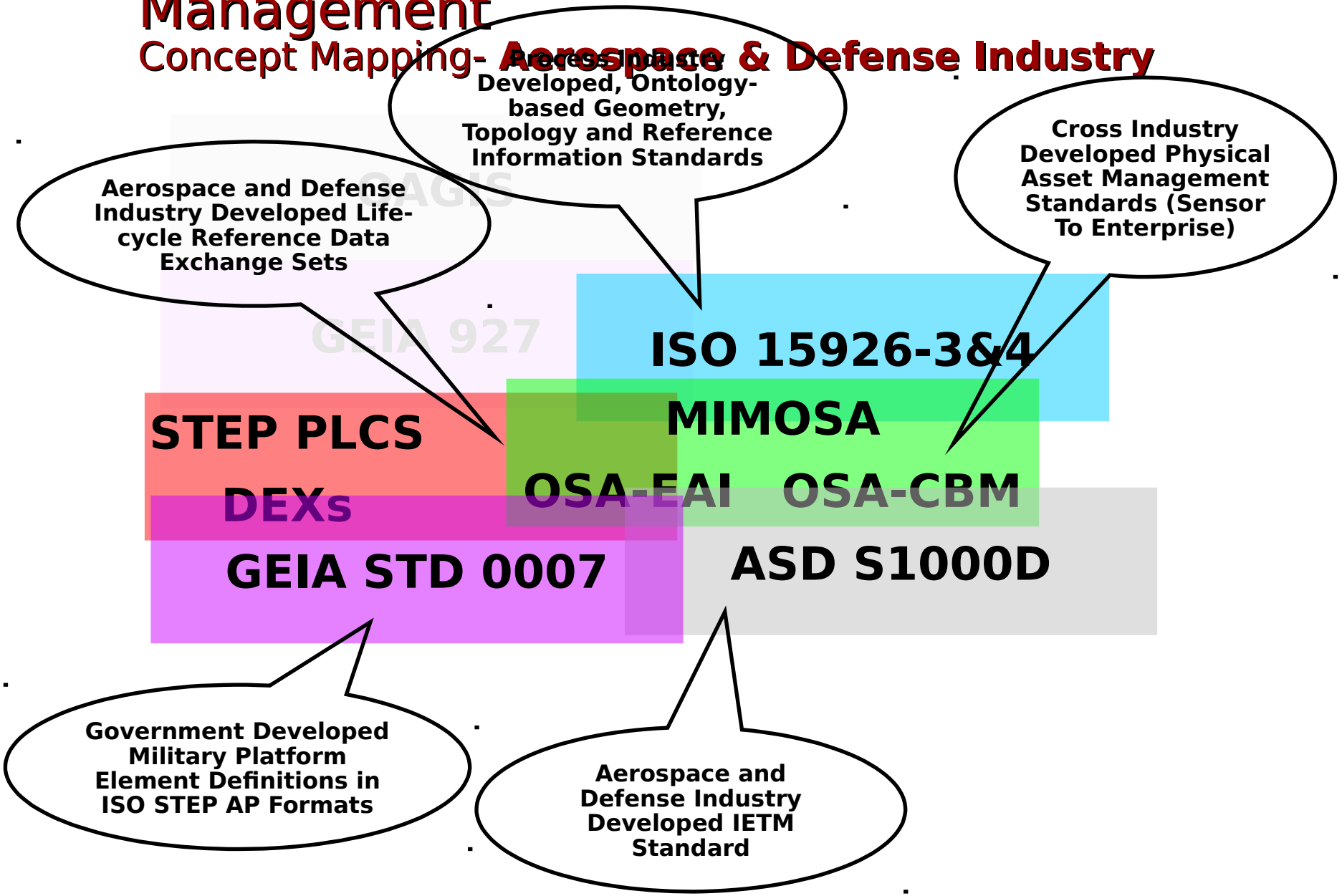
Life-cycle Information Management

Concept Mapping



Platform Life-cycle Information Management

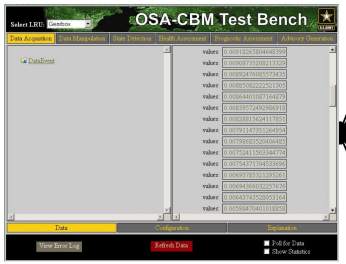
Concept Mapping- Aerospace & Defense Industry



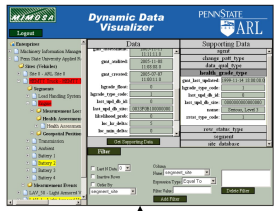
Open Standards Best Practices
Key Military Platform Sustainment Standards

IETM
S1000D
(Presentation)

Product Data
ISO 15926 and
STEP PLCS



Other examples:
Portable Maintenance Aids
Mobile Field Service Tools
Interactive Electronic Technical Manuals
Electronic Maintenance Support Systems
Etc.



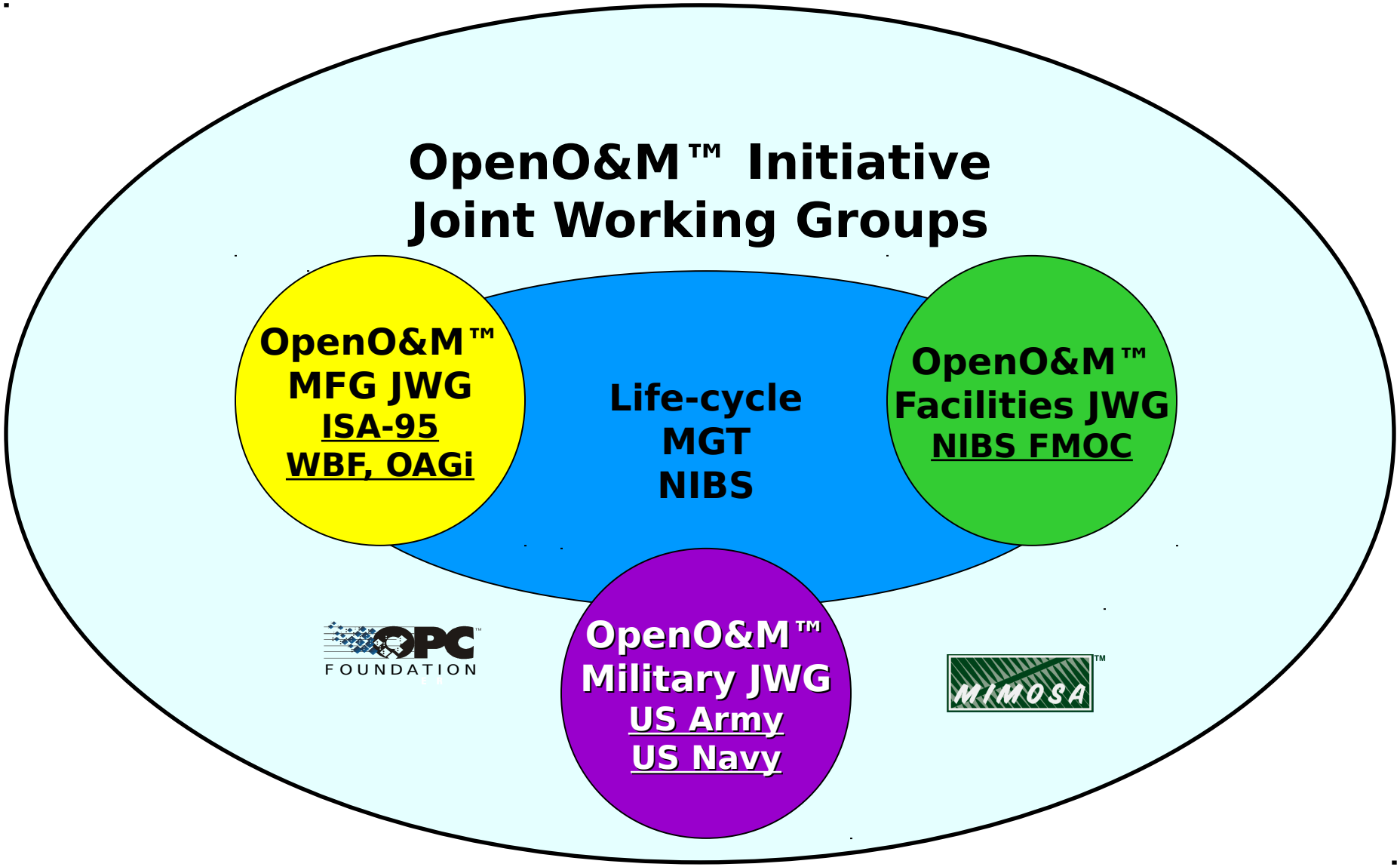
OSA-CBM Web Service
Advisory Generation
OSA-CBM XML
OSA-CBM Web Service
Prognostics Assessment
OSA-CBM Web Service
Health Assessment
OSA-CBM Web Service
State Detection
OSA-CBM Web Service
Data Manipulation
OSA-CBM Web Service
Data Acquisition
Sensor on Component or LRU

OSA-EAI Tech-CDE
Other Consumers
OSA-EAI Tech-XML
OSA-EAI Tech-CDE Web Service
OSA-EAI Tech-XML Web Service(s)
OSA-EAI Archive
OSA-EAI Tech-CDE
Proprietary algorithm(s) with open interfaces

OSA-CBM
Embedded Systems Architecture
Dynamic Data

OSA-EAI
SOA Architecture
Platform To Enterprise

Open Private/Public Sector Collaboration Model
OpenO&M™ Initiative



Some Relevant ISO Related Activities

ISO TC 108
Mechanical vibration and shock

ISO TC 184
Industrial automation systems and integration

SC5
Condition monitoring and diagnostics of machines

SC4
Industrial Data

SC5
Architecture, communication and integration frameworks

ISO 13374

MIMOSA OSA-CBM

WG6

Formats and methods for communicating, presenting and displaying relevant information and data

15926- Data for Process Industries

10303-Product data representation and exchange

STEP/PLCS

OASIS

Collaborating on the deployment of an international standard for product data exchange (ISO 10303)

DRAFT ISO 18435

MIMOSA OSA-EAI

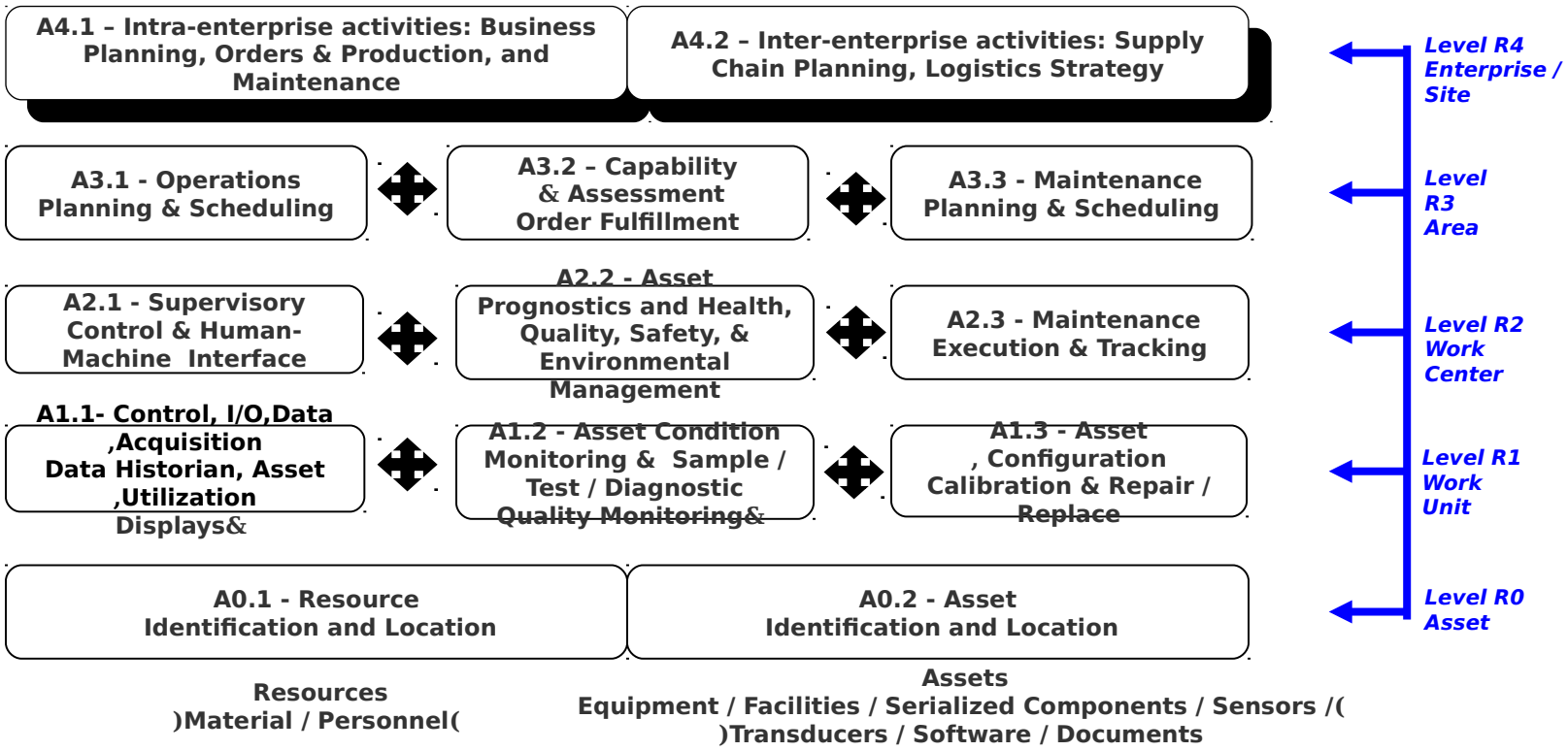
WG7

Diagnostic and maintenance applications integration

MIMOSA provides industry driven implementation specifications (schema & meta data) for Key ISO, IEC and ISA Standards to help enable practical interoperability.

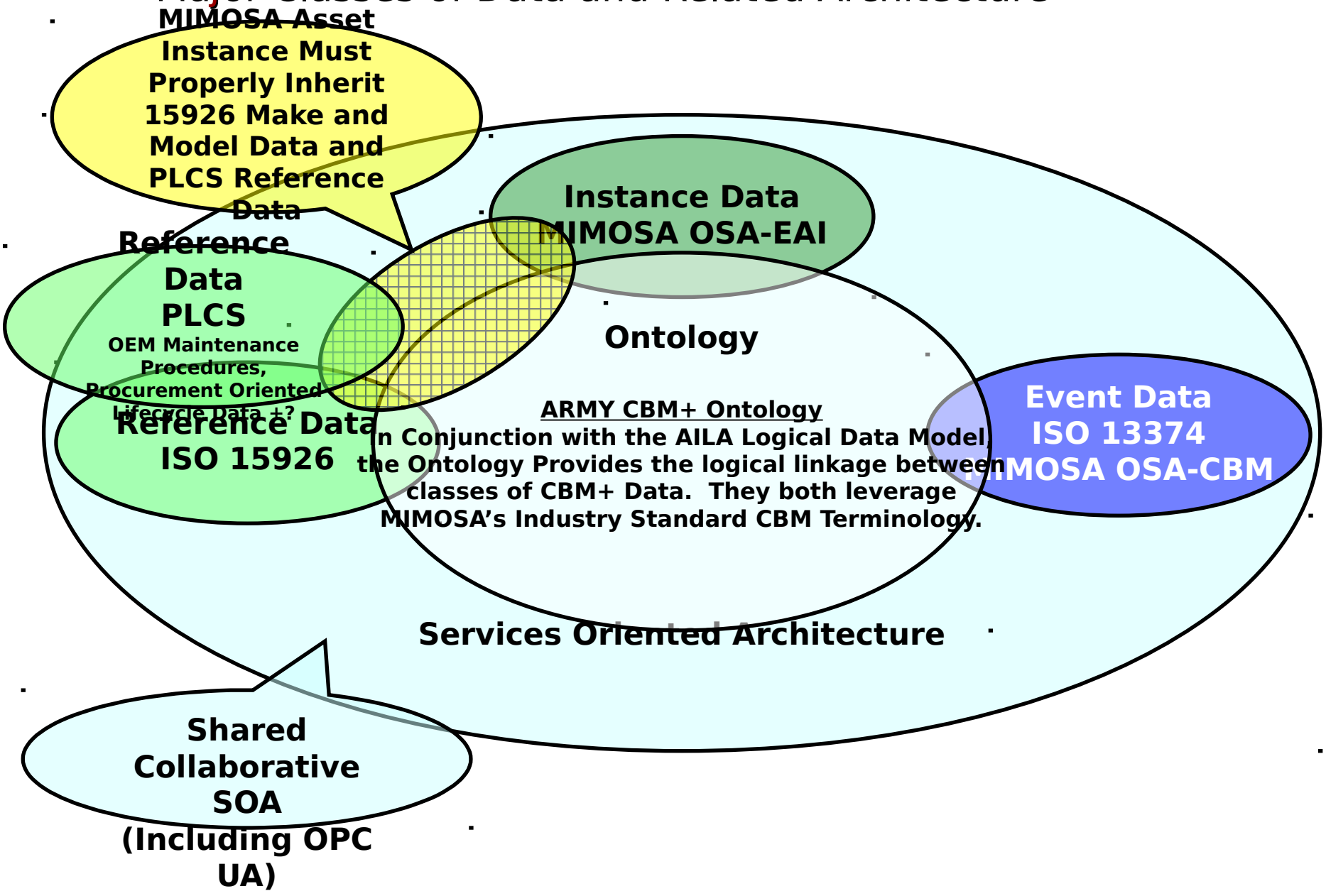
DRAFT ISO 18435
Application Domain Integration Diagram

Application Domain Integration Diagram



Logical Basis For Life-cycle Collaboration

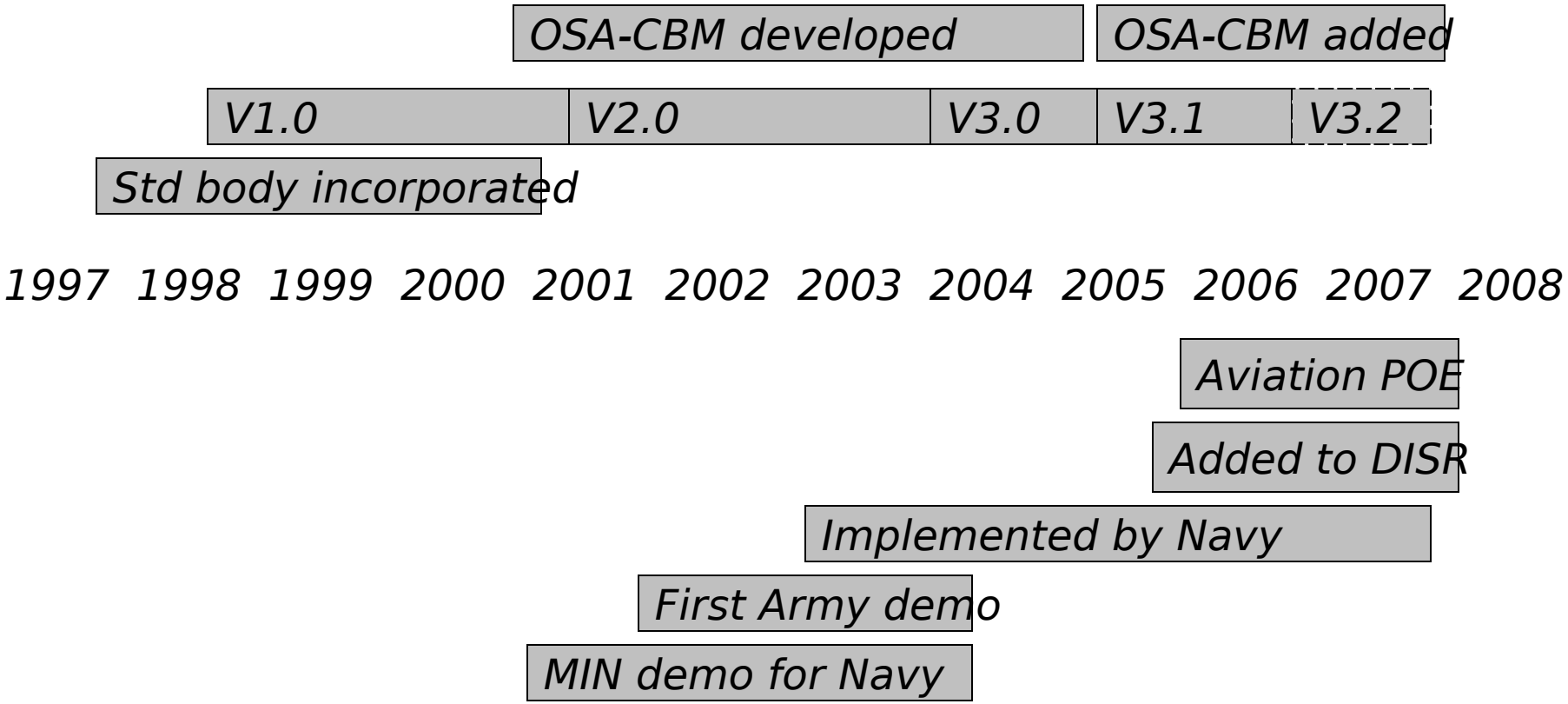
Major Classes of Data and Related Architecture



History

How have MIMOSA standards evolved?

Meeting since 1993, Incorporated in 1997



OSA-CBM DUST Program

MIMOSA Information Network Demonstration

MIMOSA Information Network (MIN)

June 21, 2000

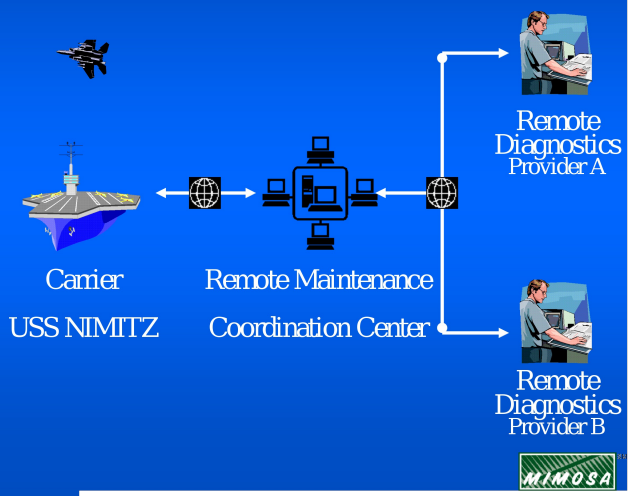
MIN-Viewer

OSA-CBM Presentation

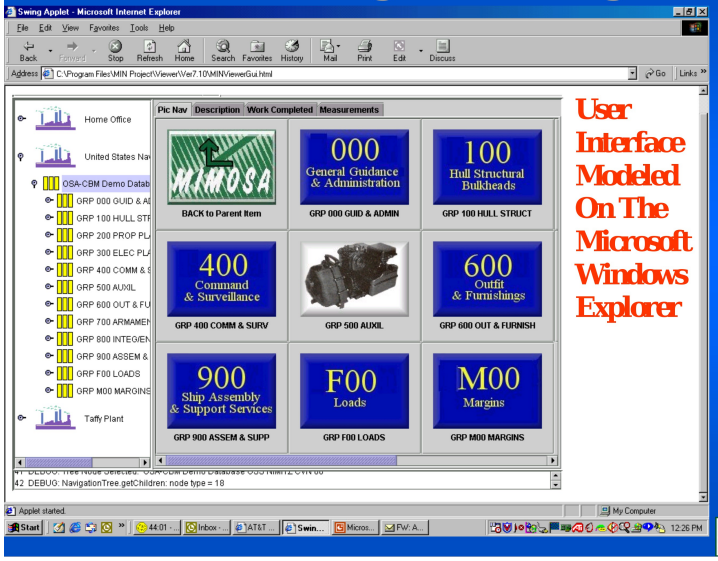
Alan T. Johnston

MIN Project Director

The OSA-CBM MIN Demonstration Concept



MIN-Viewer Segment Navigation 1



User Interface Modeled On The Microsoft Windows Explorer

U.S. Army CECOM
Collaborative Telemaintenance Demonstration

U.S. Army CECOM
Collaborative Telemaintenance Project

Phase I Demonstration Briefing - July 31, 2002

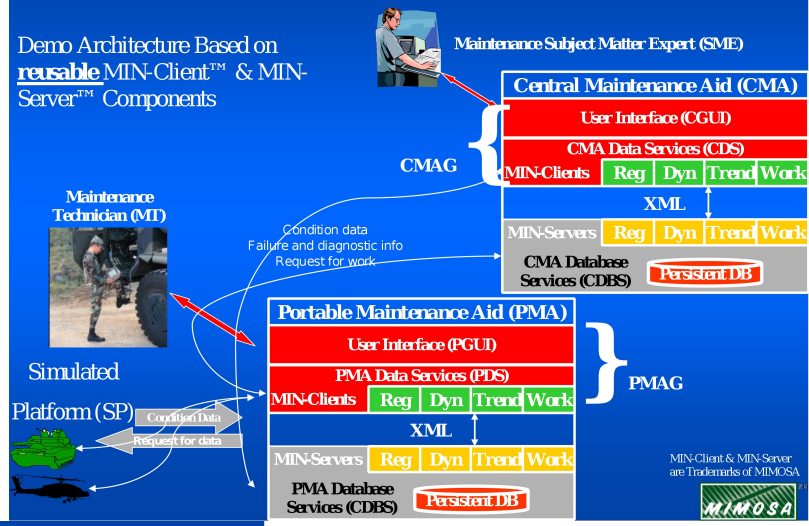
Alan Johnston - MIMOSA

Kenneth Bever - MIMOSA

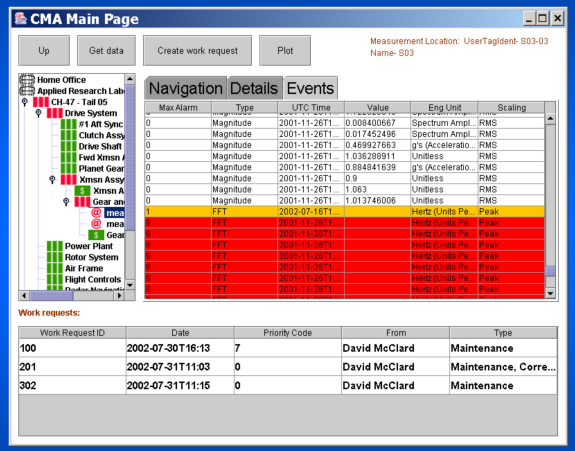
Bob Walter - Penn State ARL

U.S. Army Collaborative Telemaintenance Demonstration

Revised 07/03/2002 – Phase I Demonstration



CMA Showing Measurement Events In Alarm

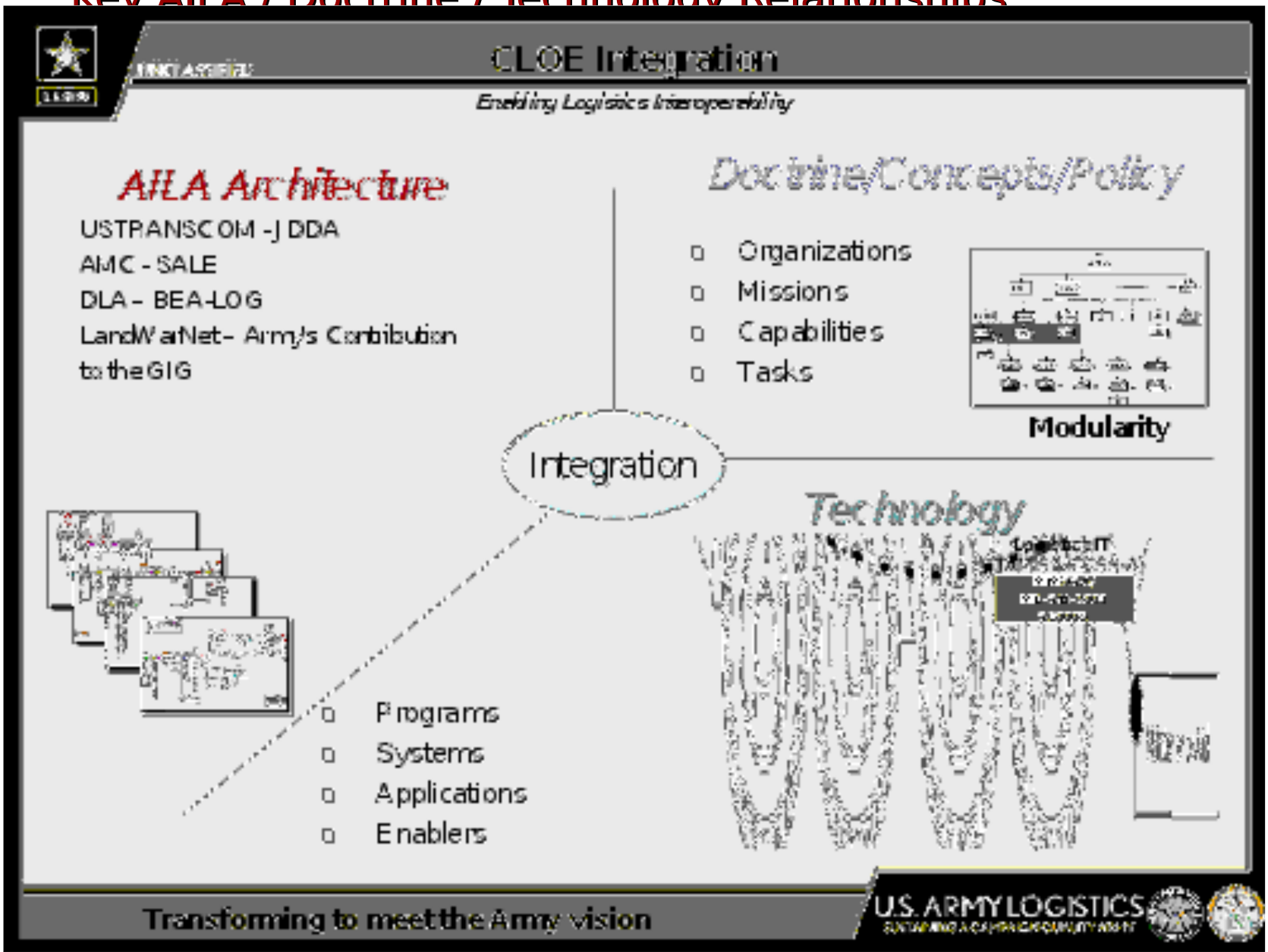


Key CLOE/AILA/MIMOSA Relationships

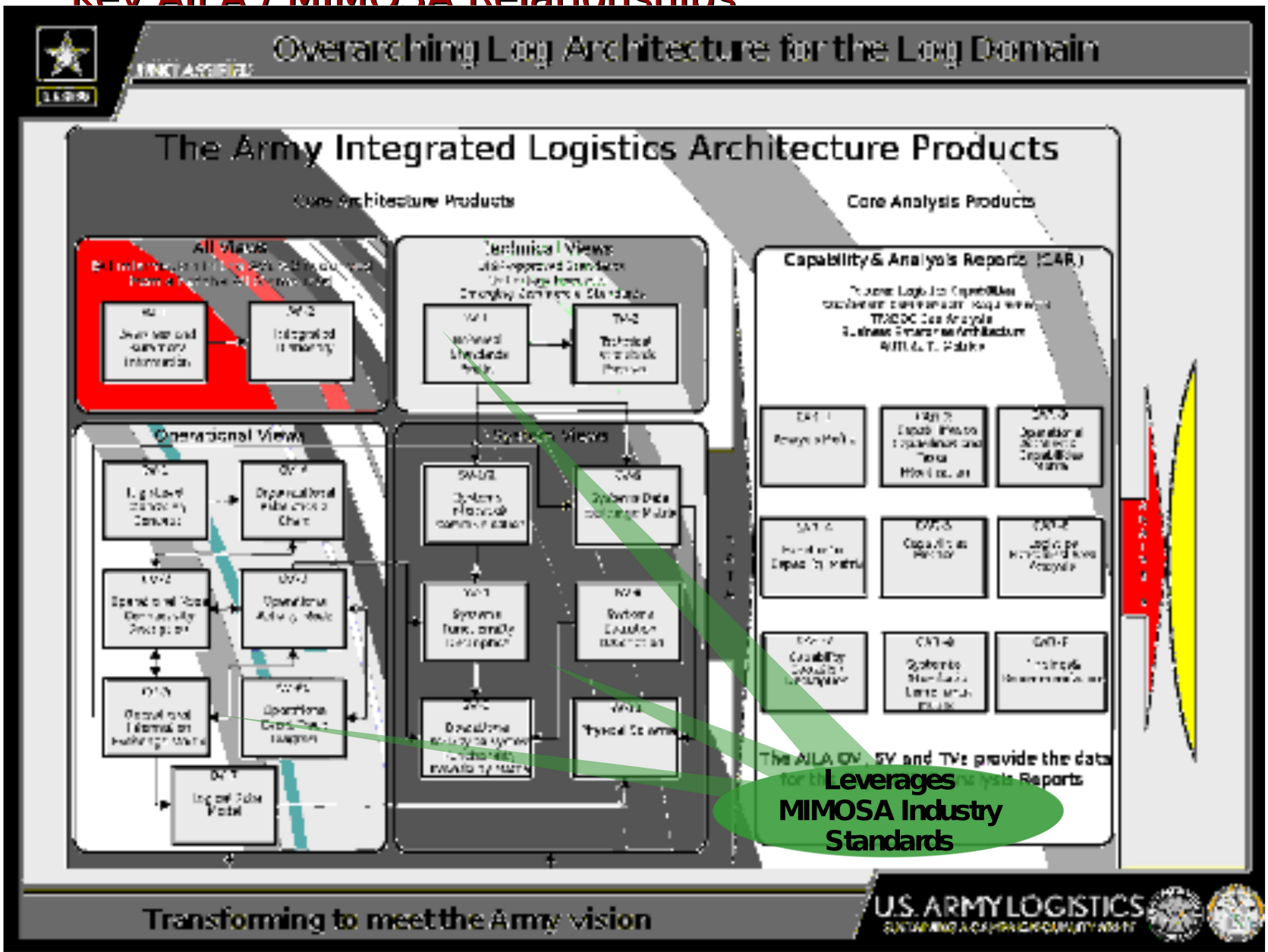
US Army Logistics Support

- **Army Logistics Innovation Agency (LIA) – Common Logistics Operating Environment (CLOE)**
- **Army CASCOM- Army Integrated Logistics Architecture (AILA)**
- **Army LOGSA – Army Logistics Support Activity**
- **AMRDEC SED - Army MIMOSA Center of Excellence**
- **Life-cycle Management Commands (LCMC)**
- **Research Design and Engineering Centers (RDEC)**

CLOE
Key AILA / Doctrine / Technology Relationships

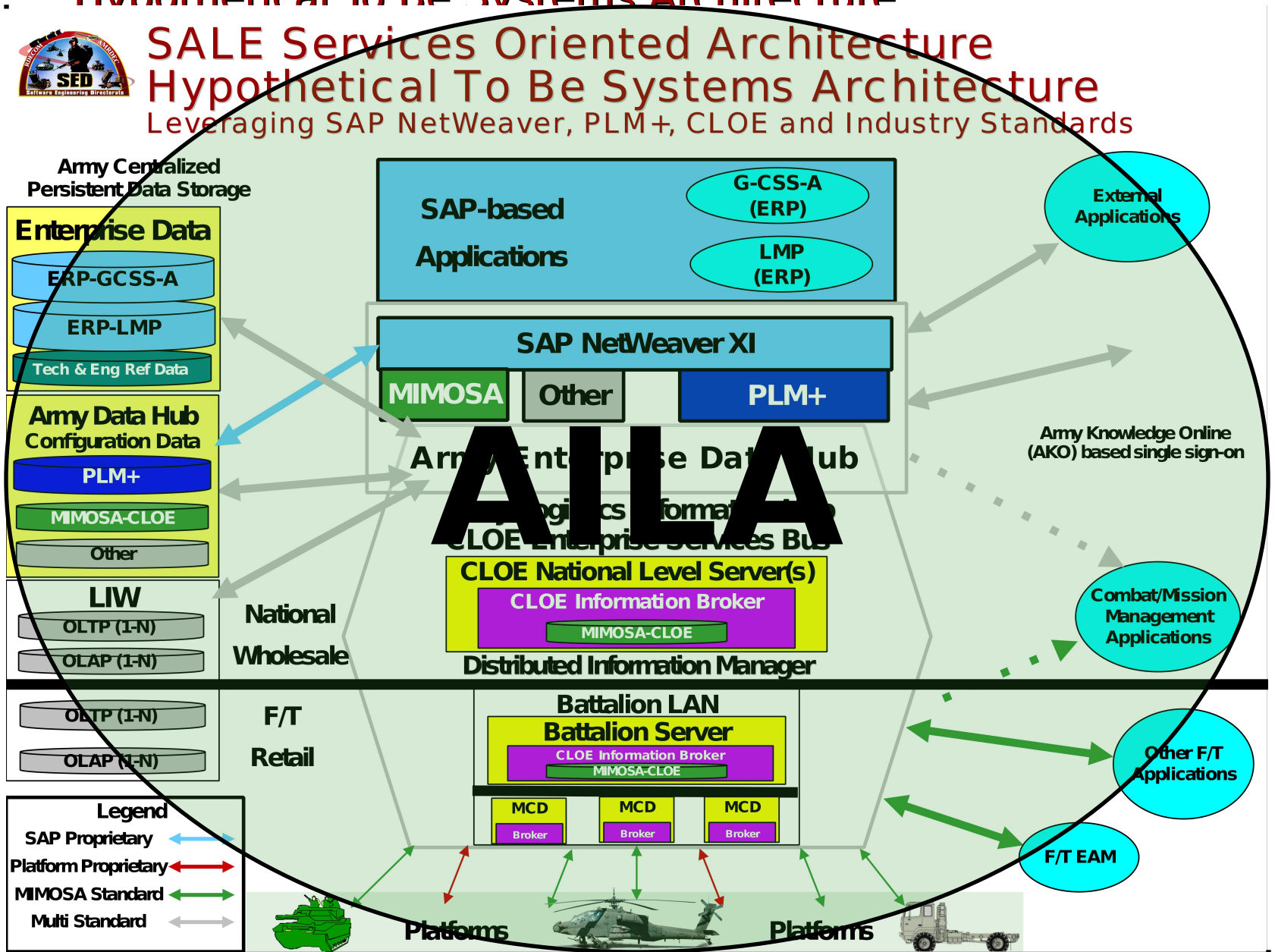


CLOE
Key AILA / MIMOSA Relationships



US Army Logistics Support
Hypothetical To Be Systems Architecture

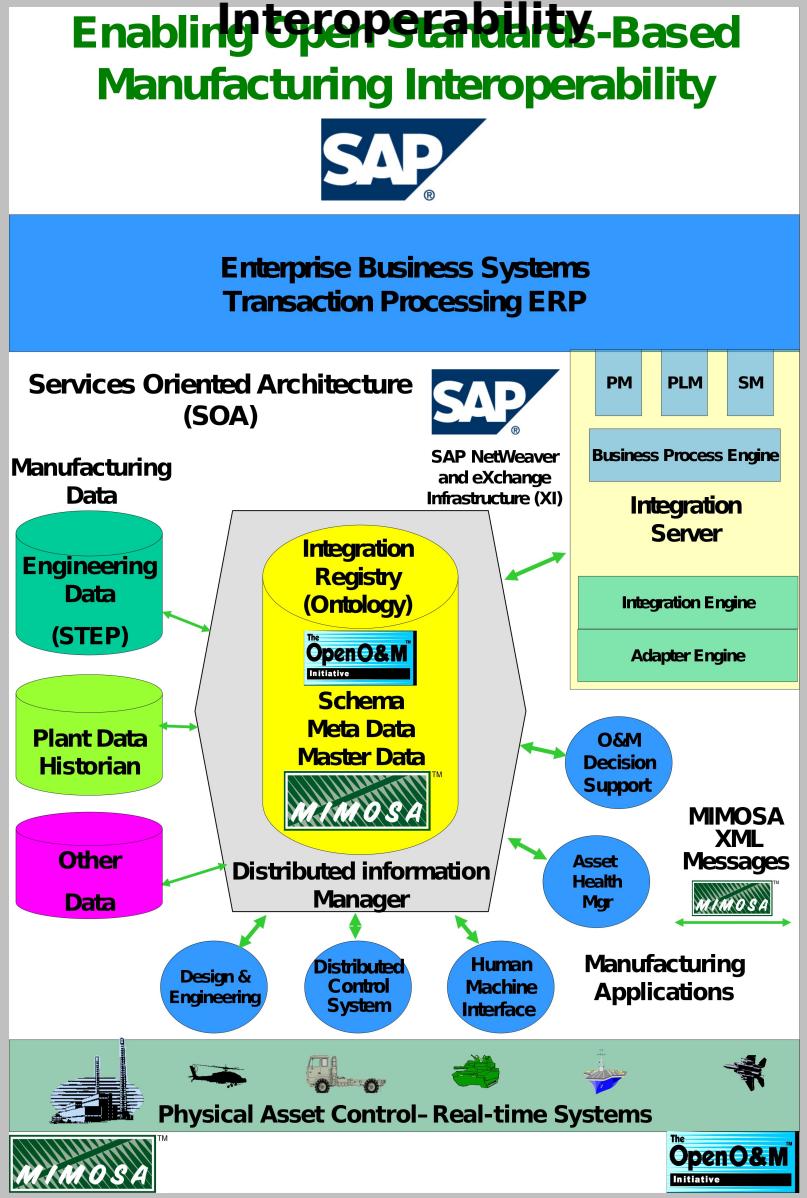
SALE Services Oriented Architecture
Hypothetical To Be Systems Architecture
Leveraging SAP NetWeaver, PLM+, CLOE and Industry Standards



ALLA

Services Oriented Architecture
Industry Best Practices

SAP Provided Poster For Industry Standards-based Interoperability



US Army MIMOSA Center of Excellence
at AMRDEC SED

The MIMOSA Center of Excellence (CoE) will accomplish its mission through focused efforts in five major functional areas.

- **Interoperability standards collaboration and coordination**
- **Army meta data management collaboration and coordination**
- **MIMOSA information standards training and certification**
- **Platform sustainment program development and implementation assistance**
- **Platform sustainment systems, applications and technologies interoperability testing and certification**

ARMY TEAM COLLABORATION and COORDINATION: *The MIMOSA CoE will collaborate and coordinate with the other Common Logistics Operating Environment (CLOE) team members and with all of the AMC Software Centers.*